Science Field Review

October 2 – December 1, 2006

Functional Independence, Supported Independence, and Participation (FI/SI/P)

Extended Benchmarks (EB)

Background Information: The federal No Child Left Behind Act of 2001 mandated the existence of a set of comprehensive state assessments that are designed and based on rigorous content. The MI-Access Science Assessment Plan Writing Team (APWT) extended the Michigan Curriculum Framework's Science Content Benchmarks, 2000 version (MCF v.2000) for the Functional Independence, Supported Independence, and Participation (FI/SI/P) student populations during the 2005-2006 school year. The draft Extended Benchmarks (EB) require field review in order to ensure they are appropriate for each population.

Instructions: Please complete the online survey for the MI-Access FI/SI/P EB in order to provide the Michigan Department of Education your feedback. The survey is located at www.mi.gov/mi-access in the "Survey Information" category.

SCIENCE
CONSTRUCTING NEW SCIENTIFIC KNOWLEDGE

Extended Benchmarks
MI-Access Functional Independence, Supported Independence, and Participation

The science benchmarks in this document are taken from the Michigan Curriculum Framework Science Content Benchmarks, 2000 version (MCF v.2000). These benchmarks have been extended for the MI-Access Functional Independence, Supported Independence, and Participation populations, and are presented in this document. The coding key below explains abbreviations found in this document, including the benchmark and extended benchmark codes.

Table of Contents and Coding Key

Content Area: Science (S)
Level of Independence:
- Full Independence: These students would most likely participate in the Michigan Educational Assessment Program (MEAP) assessments with or without accommodations.
- MI-Access Population:
  - Functional Independence (FI)
  - Supported Independence (SI)
  - Participation (PA)

Strand: Constructing New Scientific Knowledge (C) [In MCF v.2000: I]
Standard:
- Constructing New Scientific Knowledge (CN) [In MCF v.2000: I.1] 2

Grade Level:
- Elementary (e)
- Middle School (m)
- High School (h)

Extended Benchmark
- EB01, EB02, etc. [In MCF v.2000, Benchmark: 1, 2, etc.]

n/a = Not applicable

SCIENCE
STRAND: CONSTRUCTING NEW SCIENTIFIC KNOWLEDGE (CN)

All students will ask questions that help them learn about the world:

Level of Independence (Full, FI, SI, PA) and Assessable at: (Classroom / LEA / ISD; State)	**Grade Level**		
	Elementary School	**Middle School**	**High School**
Science Benchmark MCF v.2000	**I.1.e.1** Generate questions about the world based on observation. *Key concepts:* Questions lead to action, including careful observation and testing; questions often begin with "What happens if…?" or "How do these two things differ?" *Real-world contexts:* Any in the sections on Using Scientific Knowledge.	**I.1.m.1** Generate scientific questions about the world based on observation. *Key concepts:* Scientific questions can be answered by gathering and analyzing evidence about the world. *Real-world contexts:* Any in the sections on Using Scientific Knowledge.	**I.1.h.1** Ask questions that can be investigated empirically. *Key concepts:* Questions often build on existing knowledge. *Real-world contexts:* Any in the sections on Using Scientific Knowledge.

Draft Functional Independence Extended Benchmark Classroom/LEA/ISD and State	**S.FI.C.CN.e.EB01** Identify and generate questions about the world based on observation. *Key concepts:* Questions lead to action, including careful observation and testing; questions often begin with "What happens if…?" or "How do these two things differ?" *Real-world contexts:* Any in the sections on Using Scientific Knowledge. For example, by observation, tell how these two objects differ (for example, red leaf vs. green leaf, hot vs. cold).	**S.FI.C.CN.m.EB01** Identify and generate questions about the world based on observation. *Key concepts:* Questions can be answered through gathering information and observing. *Real-world contexts:* Any in the sections on Using Scientific Knowledge. For example, tell from looking at a thermometer if it is hot or cold.	**S.FI.C.CN.h.EB01** Identify and generate scientific questions about the world based on observation. *Key concepts:* Questions can be answered through gathering information, observing, and analyzing, and often build on existing knowledge. *Real-world contexts:* Life cycles of an organism.
Draft Supported Independence Extended Benchmark Classroom/LEA/ISD and State	**S.SI.C.CN.e.EB01** Identify and generate basic questions about the world around them. *Key concepts:* Who, what, when, where, why, and how. *Real-world contexts:* Students ask a question about a science topic.	**S.SI.C.CN.m.EB01** Identify and generate questions about the world around them. *Key concepts:* Who, what, where, when, why, and how. *Real-world contexts:* Students ask a question about a science topic.	**S.SI.C.CN.h.EB01** Identify and generate questions about the world based on observation. *Key concepts:* Who, what where, when, why, and how. *Real-world contexts:* Any in the sections on Using Scientific Knowledge. For example, if going on a vacation and given information about the weather, select proper attire.

Draft Participation Extended Benchmark Classroom/LEA/ISD	**S.PA.C.CN.e.EB01** Respond to questions about the world based on observation or experience. *Key concepts:* Yes, no, choices. *Real-world contexts:* Communication, interactions/social skills, personal needs, augmentative communication device.	**S.PA.C.CN.m.EB01** Respond to or ask questions about the world based on observation or experience. *Key concepts:* Yes, no, choices. *Real-world contexts:* Communication, interactions/social skills, personal needs, augmentative communication device.	**S.PA.C.CN.h.EB01** Respond to or ask questions about the world based on observation or experience. *Key concepts:* Yes, no, choices. *Real-world contexts:* Communication, interactions/social skills, personal needs, augmentative communication device.

All students will design and conduct investigations using appropriate methodology and technology:			
	Elementary School	**Middle School**	**High School**
Science Benchmark MCF v.2000	**I.1.e.2** Develop solutions to problems through reasoning, observation, and investigations. *Key concepts:* (K-2) gather information, ask questions, think; (3-5) observe, predict, collect data, draw conclusions, conduct fair tests; prior knowledge. *Real-world contexts:* Any in the sections on Using Scientific Knowledge.	**I.1.m.2** Design and conduct scientific investigations. *Key concepts:* The process of scientific investigations—test, fair test, hypothesis, theory, evidence, observations, measurements, data, conclusion. Forms for recording and reporting data—tables, graphs, journals. See C-I.i m.3 (tools). *Real-world contexts:* Any in the sections on Using Scientific Knowledge; also, recognizing differences between observations and inferences; recording observations and measurements of everyday phenomena.	**I.1.h.2** Design and conduct scientific investigations. *Key concepts:* Types of scientific knowledge—hypothesis, theory, observation, conclusion, law, data, generalization. Aspects of field research—hypothesis, design, observations, samples, analysis, conclusion. Aspects of experimental research—hypothesis, design, variable, experimental group, control group, prediction, analysis, conclusion. Investigations are based on questions about the world (see C-I.1 h.1). *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would design and /or conduct investigations.

Draft Functional Independence Extended Benchmark Classroom/LEA/ISD	**S.FI.C.CN.e.EB02** Explore problems and solutions through observation and investigation. *Key concepts:* Gather information, ask questions, predict, and observe. *Real-world contexts:* Any in the sections on Using Scientific Knowledge. For example, a flashlight is not working.	**S.FI.C.CN.m.EB02** Conduct scientific investigations. *Key concepts:* Observe, predict, collect data, use prior knowledge, draw conclusions. *Real-world contexts:* Recording observations of everyday phenomena. For example, caring for a classroom pet.	**S.FI.C.CN.h.EB02** Conduct scientific investigations. *Key concepts:* Question, hypothesis, observation, data, conclusion. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would conduct investigations. For example, determine which stain remover works best.
Draft Supported Independence Extended Benchmark Classroom/LEA/ISD	**S.SI.C.CN.e.EB02** Explore problems through observation. *Key concepts:* Gather information, ask questions, think, observe. *Real-world contexts:* Hygiene, health and nutrition, fitness, communication.	**S.SI.C.CN.m.EB02** Explore scientific investigations through observation. *Key concepts:* Observe, predict, collect data. *Real-world contexts:* Observations and predictions regarding daily routines such as personal health and hygiene, and common objects such as magnets.	**S.SI.C.CN.h.EB02** Explore scientific investigations. *Key concepts:* Observe, predict, collect data, question, hypothesis. *Real-world contexts:* Making predictions and asking questions regarding daily routines such as exercise and common occurrences such as objects rolling down inclined planes.
Draft Participation Extended Benchmark Classroom/LEA/ISD	**S.PA.C.CN.e.EB02** Explore observation activities. *Key concepts:* Observe, cause, effect. *Real-world contexts:* Personal care, health, safety, communication, group interaction.	**S.PA.C.CN.m.EB02** Explore problems through observation. *Key concepts:* Observe, cause, effect. *Real-world contexts:* Personal care, health, safety, communication, group interaction.	**S.PA.C.CN.h.EB02** Explore problems through observation. *Key concepts:* Observe, cause, effect. *Real-world contexts:* Personal care, health, safety, communication, group interaction.

	Elementary School	Middle School	High School
Science Benchmark MCF v.2000	**I.1.e.3** Manipulate simple devices that aid observation and data collection. *Tools:* Various data collection tools suitable for this level, such as hand lenses, wind direction indicators, grids for sampling areas of the sky or landscape. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would design and/or conduct investigations.	**I.1.m.3** Use tools and equipment appropriate to scientific investigations. *Tools:* Various data collection tools suitable for this level, including computers. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would design and/or conduct investigations.	None
Draft Functional Independence Extended Benchmark Classroom/LEA/ISD and State	**S.FI.C.CN.e.EB03** Identify and manipulate simple devices that aid observation and data collection. *Key concepts:* Hand lens, weather vane; pictorial reporting of observations. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would conduct investigations. For example, making general weather observations.	**S.FI.C.CN.m.EB03** Use tools and equipment appropriate to scientific investigations. *Key concepts:* Hand lens, compass, microscope; verbal reporting of observations. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would conduct investigations. For example, determining wind direction.	**S.FI.C.CN.h.EB03** Use tools and equipment appropriate to scientific investigations. *Key concepts:* Hand lens, compass, microscope, telescope, computer; microscopic vs. macroscopic; verbal reporting of observations. *Real-world contexts:* Any suggested in Using Scientific Knowledge benchmarks for which students would conduct investigations. For example, observing celestial objects.

Draft Supported Independence Extended Benchmark Classroom/LEA/ISD and State	**S.SI.C.CN.e.EB03** Identify and use simple devices. *Key concepts:* Hand lens, weather vane; oral reporting of observations. *Real-world contexts:* Daily living activities, safety.	**S.SI.C.CN.m.EB03** Identify, select, and use the appropriate simple devices. *Key concepts:* Hand lens, compass, binoculars; pictorial reporting of observations. *Real-world contexts:* Daily living activities, safety.	**S.SI.C.CN.h.EB03** Identify, select, and use the appropriate simple devices. *Key concepts:* Hand lens, compass, binoculars; verbal reporting of observations. *Real-world contexts:* Daily living activities, safety.
Draft Participation Extended Benchmark Classroom/LEA/ISD and State	**S.PA.C.CN.e.EB03** Identify simple devices. *Key concepts:* Assistive technology. *Real-world contexts:* Daily living and leisure activities, safety.	**S.PA.C.CN.m.EB03** Identify and use simple devices. *Key concepts:* Assistive technology. *Real-world contexts:* Daily living and leisure activities, safety.	**S.PA.C.CN.h.EB03** Identify and use simple devices. *Key concepts:* Assistive technology. *Real-world contexts:* Daily living and leisure activities, safety.

	Elementary School	Middle School	High School
Science Benchmark MCF v.2000	**I.1.e.4** Use simple measurement devices to make measurements in scientific investigations. *Key concepts:* Measurement units—milliliters, liters, teaspoon, tablespoon, ounce, cup, millimeter, centimeter, meter, gram. *Measurement tools:* Measuring cups and spoons, measuring tape, scale, thermometer, rulers, graduated cylinders. *Real-world contexts*: Making simple mixtures, such as food, play dough, paper mache; measuring height of a person, weight of a ball.	**I.1.m.4** Use metric measurement devices to provide consistency in an investigation. *Key concepts:* Documentation—laboratory instructions. Measurement units—milliliters, liters, millimeter, centimeter, meter, gram. *Measurement tools:* Balancing devices, measuring tape, thermometer, graduated cylinder. *Real-world contexts:* Conducting investigations, following or altering laboratory instructions for mixing chemicals.	**I.1.h.3** Recognize and explain the limitations of measuring devices. *Key concepts:* Uncertainty, error, range, tolerances, accuracy, precision. *Tools:* Balance, thermometer, measuring tape, ruler, graduated cylinder, electronic measuring devices. *Real-world contexts:* Experiments that use quantitative data; manufacturing systems where measurements are critical.

Draft Functional Independence Extended Benchmark Classroom/LEA/ISD and State	**S.FI.C.CN.e.EB04** Identify simple measurement tools and their use. *Key concepts:* Thermometer, cups, spoons, ruler, scale. *Real-world contexts:* Using the correct tool to measure weight, height, length, and temperature.	**S.FI.C.CN.m.EB04** Use standard measurement devices. *Key concepts:* Measurement units—cup, gallon, teaspoon, mile, pound. Measurement tools—cups, measuring spoons, scale, ruler, measuring tape. *Real-world contexts:* Making simple mixtures, such as food; measuring height of a person, weight of a ball.	**S.FI.C.CN.h.EB04** Choose and use simple measurement devices to make measurements in scientific investigations and real-world situations. *Key concepts:* Apply measurement units to measure accurately—cup, gallon, teaspoon, tablespoon, mile, pound, liter. Measurement tools—balance, measuring tape, odometer, thermometer, liter, scales (such as bathroom, grocery store, distance). *Real-world contexts:* Grocery store, cooking, following recipe, taking a trip.
Draft Supported Independence Extended Benchmark			
Draft Participation Extended Benchmark			

All students will learn from books and other sources of information:			
	Elementary School	**Middle School**	**High School**
Science Benchmark MCF v.2000	**I.1.e.5** Develop strategies and skills for information gathering and problem solving. *Tools:* Sources of information, such as reference books, trade books, magazines, web sites, other people's knowledge. *Real-world contexts:* Seeking help from or interviewing peers, adults, experts; using libraries, World Wide Web, CD-ROMs and other computer software, other resources.	**I.1.m.5** Use sources of information in support of scientific investigations. *Tools:* Periodicals, reference books, trade books, web sites, computer software; forms for presenting scientific information, such as figures, tables, graphs. See R-II.1 m.1 (evaluate strengths/weaknesses of claims). *Real-world contexts:* Libraries, projects where research is needed.	**I.1.h.4** Gather and synthesize information from books and other sources of information. *Key concepts:* Scientific journals, text- and computer based reference materials. *Real-world contexts:* Libraries, technical reference books, Internet, computer software.
Draft Functional Independence Extended Benchmark Classroom/LEA/ISD	**S.FI.C.CN.e.EB05** Identify and use various scientific sources of information. *Key concepts:* Books, reference books, trade books, computers, websites, periodicals (*Time for Kids, Ranger Rick*), other people. *Real-world contexts:* Seeking help from or interviewing peers, adults, or experts; using libraries; doing projects where research is needed.	**S.FI.C.CN.m.EB05** Identify and use various sources of information in support of scientific investigations. *Key concepts:* Books, reference books (almanac, dictionary), trade books, computers, websites, computer software, periodicals (*Discovery for Kids, National Geographic for Kids*), other people. *Real-world contexts:* Using libraries, technical reference books, Internet, computer software, phone book; identifying local resources.	**S.FI.C.CN.h.EB05** Identify and use various sources of information in support of scientific investigations. *Key concepts:* Books, reference books, trade books, computers, websites, computer software, periodicals (*Science World*), other people. *Real-world contexts:* Using libraries, Internet, CD-ROMs and other computer software, other resources; identifying local resources.

Draft Supported Independence Extended Benchmark Classroom/LEA/ISD	**S.SI.C.CN.e.EB04** Identify books and other sources of information related to science. *Key concepts:* Books, computers, people. *Real-world contexts:* Given a choice, students will identify the correct resource to answer a scientific question.	**S.SI.C.CN.m.EB04** Gather information on a science topic from more than one source. *Key concepts:* Books, periodicals, websites, people. *Real-world contexts:* Using *unitedstreaming* video clips, student periodicals (*Ranger Rick*, *Scholastic News*), libraries, computer.	**S.SI.C.CN.h.EB04** Use books and other resources to answer a question related to a science topic. *Key concepts:* Books, periodicals, libraries, websites, people. *Real-world contexts:* Using libraries, technical reference books, Internet, computers, phone book; identifying local resources (for example, where to go for help with a toothache).
Draft Participation Extended Benchmark Classroom/LEA/ISD	**S.PA.C.CN.e.EB04** Identify books and other sources of information. *Key concepts:* Books, computers, people. *Real-world contexts:* Students will respond to a question related to a science question by reaching, touching, vocalizing, eye movement, etc.	**S.PA.C.CN.m.EB04** Identify books and other sources of information related to science. *Key concepts:* Books, computers, people. *Real-world contexts:* Students will respond to a question related to a science question by reaching, touching, vocalizing, eye movement, etc.	**S.PA.C.CN.h.EB04** Identify books and other sources of information related to science. *Key concepts:* Books, computers, people, newspapers. *Real-world contexts:* Students will respond to a question related to a science activity by reaching, touching, vocalizing, eye movement, etc.

All students will communicate findings of investigations, using appropriate technology:			
	Elementary School	**Middle School**	**High School**
Science Benchmark MCF v.2000	**I.1.e.6** Construct charts and graphs and prepare summaries of observations. *Key concepts:* Increase, decrease, no change, bar graph, data table. *Tools:* Graph paper, rulers, crayons. *Real-world contexts*: Examples of bar charts like those found in a newspaper.	**I.1.m.6** Write and follow procedures in the form of step-by step instructions, formulas, flow diagrams, and sketches. *Key concepts:* Purpose, procedure, observation, conclusion, data. *Real-world contexts:* Listing or creating the directions for completing a task, reporting on investigations.	**I.1.h.5** Discuss topics in groups by making clear presentations, restating or summarizing what others have said, asking for clarification or elaboration, taking alternative perspectives, and defending a position. *Key concepts:* Logical argument, summary, clarification, elaboration, alternative perspectives. *Real-world contexts:* Newspaper or magazine articles discussing a topic of social concern.
Draft Functional Independence Extended Benchmark Classroom/LEA/ISD at all levels and State at elementary and middle school	**S.FI.C.CN.e.EB06** Interpret charts and graphs related to science. *Key concepts:* Bar graphs and pictographs, increase (more) and decrease (less). *Real-world contexts:* Bar charts like those found in a newspaper.	**S.FI.C.CN.m.EB06** Interpret step-by-step instructions, flow diagrams, and sketches. *Key concepts:* Purpose, procedure, observation, conclusion, data. *Real-world contexts:* Listing or creating the directions for completing a task, reporting on investigations.	**S.FI.C.CN.h.EB06** Discuss topics in groups by making clear presentations, restating or summarizing what others have said. *Key concepts:* Presentation, argument, summary. *Real-world contexts:* Newspaper or magazine articles discussing a topic of social concern.

Draft Supported Independence Extended Benchmark Classroom/LEA/ISD	**S.SI.C.CN.e.EB05** Identify and explore ways to display scientific information. *Key concepts:* With help, represent simple data with a picture graph. *Real-world contexts:* Displaying findings about heredity, such as hair color or eye color.	**S.SI.C.CN.m.EB05** Read and interpret scientific data/everyday information displayed in diagrams and sketches. *Key concepts:* Circle graph, bar graph, data table, schedules; increase, decrease, no change. *Real-world contexts:* Class schedule, television guide, newspaper.	**S.SI.C.CN.h.EB05** Explain charts and graphs used to summarize data. *Key concepts:* Line graph, bar graph, data table, schedules (television, airline), menus; increase, decrease, no change. *Real-world contexts:* Developing work schedule, chore list, daily plan, itinerary.
Draft Participation Extended Benchmark			